

**BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554**

In the Matter of:

Unlicensed Operation in the TV Broadcast
Bands

ET Docket No. 04-186

**RESPONSE OF TELCORDIA TECHNOLOGIES
AS A CONDITIONALLY DESIGNATED TV BANDS DEVICE DATABASE ADMINISTRATOR
TO THE ORDER**

February 28, 2011

TELCORDIA TECHNOLOGIES, INC.
1 Telcordia Dr
Piscataway NJ, 08854

INTRODUCTION

Telcordia Technologies, Inc. (hereafter Telcordia) herein responds to the Order released 26 January, 2011¹ (hereafter the Order) conditionally designating it as one of the TV Bands Devices Database administrators. Telcordia would like to thank the Commission and the Office of Engineering Technology (OET) for its efforts and for conditionally designating Telcordia as one of the TV Bands Devices Database administrators. Telcordia amends its earlier proposal filing of 4 January 2010 and related Comments filed 24 February 2010 with the instant filing as required by the Order. This filing demonstrates Telcordia's commitment to comply with the applicable rules, and should be considered supplemental to the original Telcordia proposal.

Telcordia has proposed a secure and flexible database design with a complete solution as one of the conditionally designated TV Band Device Database Managers. The Order required the conditional TV Band Device Database Managers to address four areas:

1. Each of the designated database administrators must supplement its previous filings with sufficient detailed information to indicate how it will comply with the rule changes adopted in the *Second MO&O*. Amendments to proposals must be received by February 28, 2011. Any of the database administrators that filed separate proposals and now wish to consolidate their operations must submit an updated proposal by this same date. Any database administrators that wish to withdraw their proposals must notify the Commission by this same date.
2. All database administrators must attend workshops to be conducted by OET to address the operation of the databases to ensure consistency and compliance with the rules and the database trials, as described herein. Each administrator shall designate a responsible party who will represent its organization at the workshops and also ensure compliance with all of the conditions herein by February 28, 2011. The first workshop is scheduled for March 10, 2011 at the Commission's Laboratory in

¹ Order in the Matter of Unlicensed Operation in the TV Broadcast Bands ET Docket 04-286 and in the Matter of Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Bnd, DA-11-131, Released 26 January, 2011.

-
- Columbia, Maryland.
3. Each database administrator must cooperate with any steps OET deems necessary to ensure compliance with the rules, including for example security features.
 4. Database administrators must agree that they will not use their capacity as a database manager to engage in any discriminatory or anti-competitive practices or any practices that may compromise the privacy of users.

Telcordia addresses each of the four areas below. The Telcordia TV Bands Devices database solution has been designed to meet the revised rules adopted in the Second Memorandum Opinion and Order² (hereafter the Second Order) which are effective as of 5 January 2011. The Telcordia solution will be prepared to demonstrate solution compliance to the OET via appropriate testing and trials as discussed in the Order. Telcordia does not at this time wish to consolidate its proposal with another participant nor does it wish to withdraw its proposal. Telcordia looks forward to cooperating with the OET and participating in the workshops and designates a responsible party in this response. Telcordia also agrees not to use its capacity as a database manager to engage in any discriminatory or anti-competitive practices or any practices that may compromise the privacy of users

1. COMPLIANCE WITH THE REVISED RULES

In the Second Order the Commission amended its Part 15 Rules for TV bands devices, and TV bands database requirements. Specifically, the Commission took the following actions as summarized in the Federal Register:

- Required that communications between TV bands devices and TV bands databases, and between multiple databases, are secure.

² Second Memorandum Opinion and Order, FCC 10-174, ET Dockets, 04-286, 02-380; released 23 September 2010 w/erratum released 19 October 2010.

-
- Required that all information that is required by the Commission's rules to be in the TV bands databases be publicly available.
 - Modified Protection Criteria for Incumbent Services.
 - Reserved two vacant UHF channels for wireless microphones and other low power auxiliary service devices in all areas of the country.
 - Allowed operators of event and production/show venues that use large numbers of wireless microphones on an unlicensed basis that cannot be accommodated in the two reserved channels and any others available at that location to register the sites of those venues on TV bands databases to receive the same geographic spacing protections afforded licensed wireless microphones.
 - Restricted fixed TV bands devices from operating on locations where the ground level is more than 76 meters above the average terrain level in the area.
 - Modified the rules governing measurement of adjacent channel emissions.
 - Amended the rules to protect Canadian and Mexican stations in the border areas by including those stations in the TV bands database as protected services.

Telcordia will demonstrate compliance with all of the applicable C.F.R. Sections including, but not limited to, § 15.712 through §15.715 which includes the following added requirements for TV Band Device Databases.

(c) Establish a process for registering fixed TVBDs and registering and including in the database facilities entitled to protection but not contained in a Commission database, including MVPD and TV translator receive sites.

(d) Establish a process for registering facilities where Part 74 low power auxiliary stations are used on a regular basis.

(e) Provide accurate lists of available channels to fixed and personal/portable TVBDs that submit to it the information required under §§ 15.713(e), (f), and (g) based on their geographic location and provide accurate lists of available channels to fixed and Mode II devices requesting lists of available channels for Mode I devices. Database administrators may allow prospective operators of TV bands devices to query the database and determine whether there are vacant channels at a particular location.

(f) Establish protocols and procedures to ensure that all communications and interactions between the TV bands database and TVBDs are accurate and secure and that unauthorized parties cannot access or alter the database or the list of available channels sent to a TVBD consistent with the provisions of Section 15.713(i).

(g) Make its services available to all unlicensed TV bands device users on a non-discriminatory basis.

(h) Provide service for a five-year term. This term can be renewed at the Commission's discretion.

(i) Respond in a timely manner to verify, correct and/or remove, as appropriate, data in the event that the Commission or a party brings claim of inaccuracies in the database to its attention. This requirement applies only to information that the Commission requires to be stored in the database.

(j) Transfer its database along with the IP addresses and URLs used to access the database and list of registered Fixed TVBDs, to another designated entity in the event

it does not continue as the database administrator at the end of its term. It may charge a reasonable price for such conveyance.

(k) The database must have functionality such that upon request from the Commission it can indicate that no channels are available when queried by a specific TVBD or model of TVBDs.

(l) If more than one database is developed, the database administrators shall cooperate to develop a standardized process for providing on a daily basis or more often, as appropriate, the data collected for the facilities listed in § 15.713(b)(2) to all other TV bands databases to ensure consistency in the records of protected facilities.

Telcordia has modified its TV Band Database solution to comply with the all of the Commission rules applicable to TV Bands database management as amended by The Second Order.

Telcordia has made modifications to allow for the additional registration data and devices, to comply with the amended HAAT calculation, to properly calculate the contours, to protect the additional channels and devices and all of the other required changes. Telcordia's solution provides the appropriate security to protect the data and the application will provide for public access as required by the rules. Telcordia has provided a complete listing of the amendments to the rules from the Second Order in Annex A of this response. Telcordia will demonstrate compliance with testing and trial participation with the OET per the Order.

In addition, Telcordia confirms that it is not currently planning to consolidate its operations with another conditionally designated TV Bands database manager and it is not withdrawing its

proposal. To the contrary, Telcordia looks forward to working with OET and the TV Bands Device industry to provide this valuable service.

2. WORKSHOP ATTENDANCE AND RESPONSIBLE PARTY DESIGNATION

Telcordia confirms that it will attend the Workshops (the first which is tentatively scheduled on 10, March 2011) with the OET to address TV Bands database operations, consistency and compliance with the rules as well as database trials.

Additionally, Telcordia designates the following as the responsible party and primary representative of Telcordia at the Workshops and for helping ensure compliance with the applicable requirements of the Second Order with regard to TV Bands Device Database administration:

John P. Malyar
Chief Architect, Interconnection Solutions
Telcordia Technologies, Inc.
1 Telcordia Dr.
Piscataway, NJ 08854
jmalyar@telcordia.com
+1 732-699-7192

3. COOPERATION WITH THE OET

Telcordia will cooperate with the OET and comply with any steps deemed necessary to ensure compliance with the rules, including for example security features. The Telcordia solution architecture is secure and flexible and is designed to accommodate such adjustments.

4. ASSURANCE OF PROVISION OF NON-DISCRIMINATORY SERVICES

Telcordia assures that it will not use its capacity as a TV Bands Devices Database manager to engage in any discriminatory or anti-competitive practices or any practices that compromises the privacy of users. Telcordia further assures that no permitted value added services it may offer to its TV Bands Devices database customers will interfere with provision of the required services in compliance with the rules of the Commission as amended by the Order.

CONCLUSION

Telcordia has built its system and is prepared to valid it with the OET in compliance with the current FCC rules as amended by the Second Order and Telcordia looks forward to working with the OET, the other database administrator, interested industry members and the public in its role as a conditionally designated TV Bands Devices Database administrator.

Respectfully submitted,

/s/ John P. Malyar

John P. Malyar
Chief Architect, Interconnection Solutions
TELCORDIA TECHNOLOGIES, INC.
1 Telcordia Dr.
Piscataway, NJ 08854
jmalyar@telcordia.com

/s/ Adam C. Newman

Adam C. Newman
Sr. Manager, Interconnection Solutions
TELCORDIA TECHNOLOGIES, INC.
1 Telcordia Dr.
Piscataway, NJ 08854
anewman@telcordia.com
Telcordia Technologies, Inc.

Date: February 28, 2011

Annex A

Telcordia will demonstrate compliance with all of the applicable FCC rules relevant to the provision of the TV Bands Devices Database Administration service including the rules as amended by the Second Order as adopted 23 September 2010 (erratum 19 October 2010) and published in the Federal Register on December 6, 2010 and noted below:

PART 15 RADIO FREQUENCY DEVICES

1. The authority citation for Part 15 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 302a, 303, 304, 307, 336, and 544a

2. Section 15.701 is revised to read as follows:

§ 15.701 Scope.

This subpart sets forth the regulations for unlicensed Television Band Devices (TVBDs). These devices are unlicensed intentional radiators that operate on available TV channels in the broadcast television frequency bands at 54-60 MHz (TV channel 2), 76-88 MHz (TV channels 5 and 6), 174-216 MHz (TV channels 7-13), 470-608 MHz (TV channels 14-36) and 614-698 MHz (TV channels 38-51).

3. Section 15.703 is revised to read as follows:

§ 15.703 Definitions.

(a) *Available channel.* A six-megahertz television channel, as specified in § 73.603 of this chapter, which is not being used by an authorized service at or near the same geographic location as the TVBD and is acceptable for use by an unlicensed device under the provisions of this subpart.

(b) *Contact verification signal.* An encoded signal broadcast by a fixed or Mode II device for reception by Mode I devices to which the fixed or Mode II device has provided a list of available channels for operation. Such signal is for the purpose of establishing that the Mode I device is still within the reception range of the fixed or Mode II device for purposes of validating the list of available channels used by the Mode I device and shall be encoded to ensure that the signal originates from the device that provided the list of available channels. A Mode I device may respond only to a contact verification signal from the fixed or Mode II device that provided the list of available channels on which it operates. A fixed or Mode II device shall provide the information needed by a Mode I device to decode the contact verification signal at the same time it provides the list of available channels.

(c) *Fixed device.* A TVBD that transmits and/or receives radiocommunication signals at a specified fixed location. A fixed TVBD may select channels for operation itself from a list of available channels provided by a TV bands database, initiate and operate a network by sending enabling signals to one or more fixed TVBDs and/or personal/portable TVBDs. Fixed devices may provide to a Mode I personal/portable device a list of available channels on which the Mode I device may operate under the rules, including available channels above 512 MHz (above TV channel 20) on which the fixed TVBD also may operate and a supplemental list of available channels above 512 MHz (above TV channel 20) that are adjacent to occupied TV channels on which the Mode I device, but not the fixed device, may operate.

(d) *Geo-location capability.* The capability of a TVBD to determine its geographic coordinates within the level of accuracy specified in section 15.711(b)(1), *i.e.* 50 meters. This capability is used with a TV bands database approved by the FCC to determine the availability of TV channels at a TVBD's location.

(e) *Mode I personal/portable device.* A personal/portable TVBD that does not use an internal geo-location capability and access to a TV bands database to obtain a list of available channels. A Mode I device must obtain a list of available channels on which it may operate from either a fixed TVBD or Mode II personal/portable TVBD. A Mode I device may not initiate a network of fixed and/or personal/portable TVBDs nor may it provide a list of available channels to another Mode I device for operation by such device.

(f) *Mode II personal/portable device.* A personal/portable TVBD that uses an internal geo-location capability and access to a TV bands database, either through a direct connection to the Internet or through an indirect connection to the Internet by way of fixed TVBD or another Mode II TVBD, to obtain a list of available channels. A Mode II device may select a channel itself and initiate and operate as part of a network of TVBDs, transmitting to and receiving from one or more fixed TVBDs or personal/portable TVBDs. A Mode II personal/portable device may provide its list of available channels to a Mode I personal/portable device for operation on by the Mode I device.

(g) *Network initiation.* The process by which a fixed or Mode II TVBD sends control signals to one or more fixed TVBDs or personal/portable TVBDs and allows them to begin communications.

(h) *Operating channel.* An available channel used by a TVBD for transmission and/or reception.

(i) *Personal/portable device.* A TVBD that transmits and/or receives radiocommunication signals at unspecified locations that may change. Personal/portable devices may only transmit on available channels in the frequency bands 512-608 MHz (TV channels 21-36) and 614-698 MHz (TV channels 38-51).

(j) *Receive site.* The location where the signal of a full service television station is received for rebroadcast by a television translator or low power TV station, including a Class A TV station, or for distribution by a Multiple Video Program Distributor (MVPD) as defined in 47 U.S.C. 602(13).

(k) *Sensing only device.* A personal/portable TVBD that uses spectrum sensing to determine a list of available channels. Sensing only devices may transmit on any available channels in the frequency bands 512-608 MHz (TV channels 21-36) and 614-698 MHz (TV channels 38-51).

(l) *Spectrum sensing*. A process whereby a TVBD monitors a television channel to detect whether the channel is occupied by a radio signal or signals from authorized services.

(m) *Television band device (TVBD)*. Intentional radiators that operate on an unlicensed basis on available channels in the broadcast television frequency bands at 54-60 MHz (TV channel 2), 76-88 MHz (TV channels 5 and 6), 174-216 MHz (TV channels 7-13), 470-608 MHz (TV channels 14-36) and 614-698 MHz (TV channels 38-51).

(n) *TV bands database*. A database system that maintains records of all authorized services in the TV frequency bands, is capable of determining the available channels as a specific geographic location and provides lists of available channels to TVBDs that have been certified under the Commission's equipment authorization procedures. TV bands databases that provide lists of available channels to TVBDs must receive approval by the Commission.

4. Section 15.706 is amended by revising paragraphs (a), (b), (c), (c)(1), (c)(2), and (c)(3) to read as follows:

15.706 Information to the user.

(a) In addition to the labeling requirements contained in § 15.19, the instructions furnished to the user of a TVBD shall include the following statement, placed in a prominent location in the text of the manual:

This equipment has been tested and found to comply with the rules for TV bands devices, pursuant to Part 15 of the FCC Rules. These rules are designed to provide reasonable protection against harmful interference. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and receiver.
3. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4. Consult the manufacturer, dealer or an experienced radio/ TV technician for help.

* * * * *

5. Section 15.707 is amended by revising paragraphs (a), (b), (c) and (d) to read as follows:

§ 15.707 Permissible channels of operation.

(a) All TVBDs are permitted to operate available channels in the frequency bands 512-608 MHz (TV channels 21-36) and 614-698 MHz (TV channels 38-51), subject to the interference protection requirements in §§ 15.711 and 15.712, except that operation of TVBDs is prohibited on the first channel above and the first channel below TV channel 37 (608-614 MHz) that are available, *i.e.*, not occupied by

an authorized service. If a channel is not available both above and below channel 37, operation is prohibited on the first two channels nearest to channel 37. These channels will be identified and protected in the TV bands database(s).

(b) Operation on available channels in the bands 54-60 MHz (TV channel 2), 76-88 MHz (TV channels 5 and 6), 174-216 MHz (TV channels 7-13) and 470-512 MHz (TV channels 14-20), subject to the interference protection requirements in §§ 15.711 and 15.712, is permitted only for fixed TVBDs that communicate only with other fixed TVBDs.

(c) Fixed and Mode II TVBDs shall operate only on available channels as identified in paragraphs (a) and (b) of this section and as determined by a TV bands database in accordance with the interference avoidance mechanisms of §§ 15.711 and 15.712.

(d) Mode I TVBDs shall operate only on available channels as identified in paragraphs (a) and (b) of this section and provided from a fixed or Mode II TVBD in accordance with § 15.711(b)(3)(iv).

6. Section 15.709 is amended by adding new paragraphs (a)(5) and (a)(6) and modifying paragraphs (a)(1), (a)(2), (a)(3), (b), and (c) to read as follows:

§ 15.709 General technical requirements.

(a) *Power limits for TVBDs.*

(1) For fixed TVBDs, the maximum power delivered to the transmitting antenna shall not exceed one watt per 6 megahertz of bandwidth on which the device operates. The power delivered to the transmitting antenna is the maximum conducted output power reduced by the signal loss experienced in the cable used to connect the transmitter to the transmit antenna. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For personal/portable TVBDs, the maximum EIRP shall not exceed 100 milliwatts (20 dBm) per 6 megahertz of bandwidth on which the device operates with the following exceptions; Mode II personal/portable TVBDs that do not meet the adjacent channel separation requirements in § 15.712(a) and Mode I personal/portable TVBDs that operate on available channels (provided by a Mode II TVBD) that do not meet the adjacent channel separation requirements of § 15.712(a) are limited to a maximum EIRP of 40 milliwatts (16 dBm) per 6 megahertz of bandwidth on which the device operates.

(3) TVBDs shall incorporate transmit power control to limit their operating power to the minimum necessary for successful communication. Applicants for equipment certification shall include a description of a device's transmit power control feature mechanism.

(4) Maximum conducted output power is the total transmit power over the occupied bandwidth delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(5) The power spectral density conducted from the TVBD to the antenna shall not be greater than the following values when measured in any 100 kHz band during any time interval of continuous transmission:

- (i) Fixed devices: 12.2 dBm

-
- (ii) Personal/portable devices operating adjacent to occupied TV channels: -1.8 dBm
 - (iii) Sensing-only devices: -0.8 dBm
 - (iii) All other personal/portable devices: 2.2 dBm
 - (6) TVBDs shall incorporate adequate security measures to prevent the TVBD from accessing databases not approved by the FCC and to ensure that unauthorized parties can not modify the TVBD or configure its control features to operate inconsistent with the rules and protection criteria set forth in this subpart.

(b) *Antenna requirements.*

- (1) All transmit and receive antenna(s) of personal/portable devices shall be permanently attached.
- (2) The transmit antenna used with fixed devices may not be more than 30 meters above the ground. In addition, fixed devices may not be located at sites where the height above average terrain (HAAT) at ground level is more than 76 meters. The ground level HAAT is to be calculated by the TV bands database that the device contacts for available channels using computational software employing the methodology in section 73.684(d) of this chapter.
- (3) For personal/portable TVBDs operating under § 15.717, the provisions of § 15.204(c)(4) do not apply to an antenna used for transmission and reception/spectrum sensing.
- (4) For personal/portable TVBDs operating under § 15.717 that incorporate a separate sensing antenna, compliance testing shall be performed using the lowest gain antenna for each type of antenna to be certified.

(c) *Emission limits for TVBDs.*

- (1) In the television channels immediately adjacent to the channel in which a TVBD is operating, emissions from the TVBD shall be at least 72.8 dB below the highest average power in the TV channel in which the device is operating.
- (2) Emission measurements in the channel of operation shall be performed over a reference bandwidth of 6 megahertz with an average detector. Emission measurements in the adjacent channels shall be performed using a minimum resolution bandwidth of 100 kHz with an average detector. A narrower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 100 kHz.
- (3) At frequencies beyond the television channels immediately adjacent to the channel in which the TVBD is operating, the radiated emissions from TVBDs shall meet the requirements of § 15.209.

* * * * *

- 7. Section 15.711 is amended by revising the section heading and introductory text and by revising paragraphs (a) through (f) to read as follows:

§ 15.711 Interference avoidance methods.

Except as provided in § 15.717, television channel availability for a TVBD is determined based on the geo-location and database access method described in paragraphs (a) and (b) of this section.

- (a) *Geo-location and database access.* A TVBD shall rely on the geo-location and database access mechanism to identify available television channels consistent with the interference protection requirements of § 15.712. Such protection will be provided for the following authorized and unlicensed services: digital television stations, digital and analog Class A, low power, translator and booster stations; translator receive operations; fixed broadcast auxiliary service links; private land mobile service/commercial radio service (PLMRS/CMRS) operations; offshore radiotelephone service; low power

auxiliary services authorized pursuant to §§ 74.801-74.882 of this chapter, including wireless microphones and MVPD receive sites; and unlicensed wireless microphones used by venues of large events and productions/shows as provided under section 15.713(h)(8). In addition, protection shall be provided in border areas near Canada and Mexico in accordance with § 15.712(g).

(b) Geo-location and database access requirements.

(1) The geographic coordinates of a fixed TVBD shall be determined to an accuracy of +/- 50 meters by either an incorporated geo-location capability or a professional installer. In the case of professional installation, the party who registers the fixed TVBD in the database will be responsible for assuring the accuracy of the entered coordinates. The geographic coordinates of a fixed TVBD shall be determined at the time of installation and first activation from a power-off condition, and this information may be stored internally in the TVBD. If the fixed TVBD is moved to another location or if its stored coordinates become altered, the operator shall re-establish the device's:

(i) Geographic location and store this information in the TVBD either by means of the device's incorporated geo-location capability or through the services of a professional installer; and

(ii) Registration with the database based on the device's new coordinates.

(2) A Mode II personal/portable device shall incorporate a geo-location capability to determine its geographic coordinates to an accuracy of +/- 50 meters. A Mode II device must also re-establish its position each time it is activated from a power-off condition and use its geo-location capability to check its location at least once every 60 seconds while in operation, except while in sleep mode, *i.e.*, in a mode in which the device is inactive but is not powered-down.

(3)(i) Fixed devices must access a TV bands database over the Internet to determine the TV channels that are available at their geographic coordinates, taking into consideration the fixed device's antenna height, prior to their initial service transmission at a given location. Operation is permitted only on channels that are indicated in the database as being available for such TVBDs. Fixed TVBDs shall access the database at least once a day to verify that the operating channels continue to remain available. Operation on a channel must cease immediately if the database indicates that the channel is no longer available. Fixed TVBD must adjust their use of channels in accordance with channel availability schedule information provided by their database for the 48 hour period beginning at the time of the device last accessed the database for a list of available channels.

(ii) Mode II personal/portable devices must access a TV bands database over the Internet to determine the TV channels that are available at their geographic coordinates prior to their initial service transmission at a given location. Operation is permitted only on channels that are indicated in the database as being available for personal/portable TVBDs. A Mode II personal/portable device must access the database for a list of available channels each time it is activated from a power-off condition and re-check its location and the database for available channels if it changes location during operation by more than 100 meters from the location at which it last accessed the database. A Mode II personal/portable device that has been in a powered state shall re-check its location and access the database daily to verify that the operating channel(s) continue to be available. Mode II personal/portable devices must adjust their use of channels in accordance with channel availability schedule information provided by their database for the 48 hour period beginning at the time of the device last accessed the database for a list of available channels. A Mode II personal/portable device may load channel availability information for multiple locations around, *i.e.*, in the vicinity of, its current location and use that information in its operation. A Mode II TVBD may use such available channel information to define a geographic area within which it can operate on the same available channels at all locations, for example a Mode II TVBD could calculate a bounded area in which a channel or channels are available at all locations within the area and operate on a mobile basis within that area. A Mode II TVBD using such channel availability information for multiple locations must contact the database again if/when it moves beyond the boundary of the area where the channel

availability data is valid, and must access the database daily even if it has not moved beyond that range to verify that the operating channel(s) continue to be available. Operation must cease immediately if the database indicates that the channel is no longer available.

(iii) If a fixed or Mode II personal/portable TVBD fails to successfully contact the TV bands database during any given day, it may continue to operate until 11:59 PM of the following day at which time it must cease operations until it re-establishes contact with the TV bands database and re-verifies its list of available channels.

(iv) A Mode I personal/portable TVBD may only transmit upon receiving a list of available channels from a fixed or Mode II TVBD that has contacted a database and verified that the FCC identifier (FCC ID) of the Mode I device is valid. The list of channels provided to the Mode I device must be the same as the list of channels that are available to the fixed or Mode II device, except that a Mode I device may operate only on channels that are permissible for its use under §15.707. A fixed device may also obtain from a database a separate list of available channels that includes adjacent channels that would be available to a Mode I personal/portable device and provide that list to the Mode I device. A fixed or Mode II device may provide a Mode I device with a list of available channels only after it contacts its database, provides the database the FCC Identifier (FCC ID) of the Mode I device requesting available channels, and receives verification that the FCC ID is valid for operation. To initiate contact with a fixed or Mode II device, a Mode I device may transmit on an available channel used by the fixed or Mode II TVBD or on a channel the fixed or Mode II TVBD indicates is available for use by a Mode I device on a signal seeking such contacts. At least once every 60 seconds, except when in sleep mode, *i.e.*, a mode in which the device is inactive but is not powered-down, a Mode I device must either receive a contact verification signal from the Mode II or fixed device that provided its current list of available channels or contact a Mode II or fixed device to re-verify/re-establish channel availability. A Mode I device must cease operation immediately if it does not receive a contact verification signal or is not able to re-establish a list of available channels through contact with a fixed or Mode II device on this schedule. In addition, a Mode II device must re-check/reestablish contact with a fixed or Mode II device to obtain a list of available channels if they lose power. Collaterally, if a Mode II device loses power and obtains a new channel list, it must signal all Mode I devices it is serving to acquire new channel list.

(v) Device manufacturers and database administrators may implement a system that pushes updated channel availability information from the database to TVBDs. However, the use of such systems is not mandatory, and the requirements for TVBDs to validate the operating channel at least daily and to cease operation in accordance with paragraph (b)(3)(iii) of this section continue to apply if such a system is used.

(vi) TV bands devices shall incorporate adequate security measures to ensure that they are capable of communicating for purposes of obtaining lists of available channels only with databases operated by administrators authorized by the Commission, and to ensure that communications between TV bands devices and databases between TV bands devices are secure to prevent corruption or unauthorized interception of data. This requirement includes implementing security for communications between Mode I personal portable devices and fixed or Mode II devices for purposes of providing lists of available channels.

* * * * *

(c) *Display of available channels.* A TVBD must incorporate the capability to display a list of identified available channels and its operating channels.

(d) *Identifying information.* Fixed TVBDs shall transmit identifying information. The identification signal must conform to a standard established by a recognized industry standards setting organization.

The identification signal shall carry sufficient information to identify the device and its geographic coordinates.

(e) *Fixed devices without a direct connection to the Internet.* If a fixed TVBD does not have a direct connection to the Internet and has not yet been initialized and registered with the TV bands database consistent with § 15.713, but can receive the transmissions of another fixed TVBD, the fixed TVBD needing initialization may transmit to that other fixed TVBD on either a channel that the other TVBD has transmitted on or on a channel which the other TVBD indicates is available for use to access the database to register its location and receive a list of channels that are available for it to use. Subsequently, the newly registered TVBD must only use the television channels that the database indicates are available for it to use. A fixed device may not obtain lists of available channels from another fixed device as provided by a TV bands database for such other device, *i.e.*, a fixed device may not simply operate on the list of available channels provided by a TV bands database for another fixed device with which it communicates but must contact a database to obtain a list of available channels on which it may operate.

(f) *Security.*

(i) For purposes of obtaining a list of available channels and related matters, fixed and Mode II TVBDs shall only be capable of contacting databases operated by FCC designated administrators.

(ii) Communications between TV bands devices and TV bands databases are to be transmitted using secure methods that ensure against corruption or unauthorized modification of the data; this requirement applies to communications of channel availability and other spectrum access information between fixed and Mode II devices (it is not necessary for TVBDs to apply security coding to channel availability and channel access information where they are not the originating or terminating device and that they simply pass through).

(iii) Communications between a Mode I device and a fixed or Mode II device for purposes of obtaining a list of available channels shall employ secure methods that ensure against corruption or unauthorized modification of the data. When a Mode I device makes a request to a fixed or Mode II device for a list of available channels the receiving device shall check with the TV bands database that the Mode I device has a valid FCC Identifier before providing a list of available channels. Contact verification signals transmitted for Mode I devices are to be encoded with encryption to secure the identity of the transmitting device. Mode I devices using contact verification signals shall accept as valid for authorization only the signals of the device from which they obtained their list of available channels.

(iv) A TV bands database shall be protected from unauthorized data input or alteration of stored data. To provide this protection, the administrator of the TV bands database administrator shall establish communications authentication procedures that allow the fixed or Mode II devices to be assured that the data they receive is from an authorized source.

(v) Applications for certification of TV bands devices are to include a high level operational description of the technologies and measures that are incorporated in the device to comply with the security requirements of this section. In addition, applications for certification of fixed and Mode II devices are to identify at least one of the TV bands databases operated by a designated TV bands database administrator that the device will access for channel availability and affirm that the device will conform to the communications security methods used by that database.

* * * * *

8. Section 15.712 is amended by revising paragraphs a(1), a(2), (b), (d), (f), (g) and (h)(3) to read as follows:

§ 15.712 Interference protection requirements.

(a) * * *

(1) Protected contour. TVBDs must protect digital and analog TV services within the contours shown in the following table. These contours are calculated using the methodology in § 73.684 of this chapter and the R-6602 curves contained in § 73.699 of this chapter.

Type of station	Protected contour		
	Channel	Contour (dBu)	Propagation curve
Analog: Class A TV, LPTV, translator and booster	Low VHF (2-6)	47	F(50,50)
	High VHF (7-13)	56	F(50,50)
	UHF (14-69)	64	F(50,50)
Digital: Full service TV, Class A TV, LPTV, translator and booster	Low VHF (2-6)	28	F(50,90)
	High VHF (7-13)	36	F(50,90)
	UHF (14-51)	41	F(50,90)

(2) Required separation distance. TVBDs must be located outside the contours indicated in paragraph (1) of this section of co-channel and adjacent channel stations by at least the minimum distances specified in the following table. Personal/portable TVBDs operating in Mode II must comply with the separation distances specified for an unlicensed device with an antenna height of less than 3 meters. Alternatively, Mode II personal/portable TVBDs may operate at closer separation distances, including inside the contour of adjacent channel stations, provided the power level is reduced to 40 mW or less as specified in § 15.709(a)(2).

Antenna Height of Unlicensed Device	Required Separation (km) From Digital or Analog TV (Full Service or Low Power) Protected Contour	
	Co-channel	Adjacent Channel
Less than 3 meters	6.0 km	0.1 km
3 – Less than 10 meters	8.0 km	0.1 km
10 – 30 meters	14.4 km	0.74 km

(b) *TV translator, Low Power TV (including Class A) and Multi-channel Video Programming Distributor (MVPD) receive sites.* MVPD, TV translator station and low power TV (including Class A) station receive sites located outside the protected contour of the TV station(s) being received may be registered in the TV bands database if they are no farther than 80 km outside the nearest edge of the relevant contour(s). Only channels received over the air and used by the MVPD, TV translator station or low power/Class A TV station may be registered. TVBDs may not operate within an arc of +/-30 degrees from a line between a registered receive site and the contour of the TV station being received in the direction of the station's transmitter at a distance of up to 80 km from the edge of the protected contour of the received TV station for co-channel operation and up to 20 km from the registered receive site for adjacent channel operation, except that the protection distance shall not exceed the distance from the receive site to the protected contour. Outside of this +/-30 degree arc, TVBDs may not operate within 8 km from the receive site for co-channel operation and 2 km from the receive site for adjacent channel

operation. For purposes of this section, a TV station being received may include a full power TV station, TV translator station or low power TV/Class A TV station.

* * * * *

(d) *PLMRS/CMRS operations*: TVBDs may not operate at distances less than 134 km for co-channel operations and 131 km for adjacent channel operations from the coordinates of the metropolitan areas and on the channels listed in § 90.303(a) of this chapter. For PLMRS/CMRS operations authorized by waiver outside of the metropolitan areas listed in § 90.303(a) of this chapter, co-channel and adjacent channel TVBDs may not operate closer than 54 km and 51 km, respectively from a base station.

(f) *Low power auxiliary services, including wireless microphones*:

(1) Fixed TVBDs are not permitted to operate within 1 km, and personal/portable TVBDs will not be permitted to operate within 400 meters, of the coordinates of registered low power auxiliary station sites on the registered channels during the designated times they are used by low power auxiliary stations.

(2) TVBDs are not permitted to operate on the first channel on each side of TV channel 37 (608-614 MHz) that is not occupied by a licensed service.

(g) *Border areas near Canada and Mexico*: Fixed and personal/portable TVBDs shall comply with the required separation distances in §15.712(a)(2) from the protected contours of TV stations in Canada and Mexico. TVBDs are not required to comply with these separation distances from portions of the protected contours of Canadian or Mexican TV stations that fall within the United States.

(h) *Radio astronomy services*: Operation of fixed and personal/portable TVBDs is prohibited on all channels within 2.4 kilometers at the following locations.

(1) * * *

(2) * * *

(3) The following facilities.

Observatory	Longitude (Deg/Min/Sec)	Latitude (Deg/Min/Sec)
Allen Telescope Array	121 28 24 W	40 49 04 N
Arecibo Observatory	066 45 11 W	18 20 46 N
Green Bank Telescope (GBT)	079 50 24 W	38 25 59 N
Very Large Array (VLA)	Rectangle between latitudes 33 58 22 N and 34 14 56 N, and longitudes 107 24 40 W and 107 48 22 W	
Very Long Baseline Array (VLBA) Stations		
Pie Town, AZ	108 07 07 W	34 18 04 N
Kitt Peak, AZ	111 36 42 W	31 57 22 N
Los Alamos, NM	106 14 42 W	35 46 30 N
Ft. Davis, TX	103 56 39 W	30 38 06 N
N. Liberty, IA	091 34 26 W	41 46 17 N
Brewster, WA	119 40 55 W	48 07 53 N
Owens Valley, CA	118 16 34 W	37 13 54 N

St. Croix, VI	064 35 03 W	17 45 31 N
Hancock, NH	071 59 12 W	42 56 01 N
Mauna Kea, HI	155 27 29 W	19 48 16 N

9. Section 15.713 is amended by revising paragraphs (a)(1), (b)(2)(i), (c)(2), (d), (e), (f)(3), (h)(1), (h)(6), (h)(7) and (h)(8) and adding new paragraph (j) to read as follows:

§ 15.713 TV bands database.

(a) * * *

(1) To determine and provide to a TVBD, upon request, the available TV channels at the TVBD's location. Available channels are determined based on the interference protection requirements in § 15.712. A database must provide fixed and Mode II personal portable TVBDs with channel availability information that includes scheduled changes in channel availability over the course of the 48 hour period beginning at the time the TVBDs make a re-check contact. In making lists of available channels available to a TVBD, the TV bands database shall ensure that all communications and interactions between the TV bands database and the TVBD include adequate security measures such that unauthorized parties cannot access or alter the TV bands database or the list of available channels sent to TVBDs or otherwise affect the database system or TVBDs in performing their intended functions or in providing adequate interference protections to authorized services operating in the TV bands. In addition, a TV bands database must also verify that the FCC identifier (FCC ID) of a device seeking access to its services is valid; under this requirement the TV bands database must also verify that the FCC ID of a Mode I device provided by a fixed or Mode II device is valid. A list of devices with valid FCC IDs and the FCC IDs of those devices is to be obtained from the Commission's Equipment Authorization System.

* * * * *

(b) * * *

(1) * * *

(2) * * *

(i) MVPD receive sites

* * * * *

(c) *Restrictions on registration.*

(1) Television translator, low power TV and Class A TV station receive sites within the protected contour or more than 80 kilometers from the nearest edge of the protected contour of the station being received are not eligible for registration in the database.

(2) MVPD receive sites within the protected contour or more than 80 kilometers from the nearest edge of the protected contour of a television station being received are not eligible to register that station's channel in the database.

(d) *Determination of available channels.* The TV bands database will determine the available channels at a location using the interference protection requirements of § 15.712, the location information supplied by a TVBD, and the data for protected stations/locations in the database.

(e) *TVBD initialization.*

-
- (1) Fixed and Mode II TVBDs must provide their location and required identifying information to the TV bands database in accordance with the provisions of this subpart.
 - (2) Fixed and Mode II TVBDs shall not transmit unless they receive, from the TV bands database, a list of available channels and may only transmit on the available channels on the list provided by the database.
 - (3) Fixed TVBDs register and receive a list of available channels from the database by connecting to the Internet, either directly or through another fixed TVBD that has a direct connection to the Internet.
 - (4) Mode II TVBDs receive a list of available channels from the database by connecting to the Internet, either directly or through a fixed or Mode II TVBD that has a direct connection to the Internet.
 - (5) A fixed or Mode II TVBD that provides a list of available channels to a Mode I device shall notify the database of the FCC identifier of such Mode I device and receive verification that that FCC identifier is valid before providing the list of available channels to the Mode I device.
 - (6) A fixed device located at a site where the ground level height above average terrain (HAAT) is greater than 76 meters shall not be provided a list of available channels. The ground level HAAT of sites occupied by fixed TVBDs is to be calculated using computational software employing the methodology in section 73.684(d) of this chapter.

(f) * * *

(1) * * *

(2) * * *

(3) The TVBD registration database shall contain the following information for fixed TVBDs:

(i) FCC identifier (FCC ID) of the device

(ii) manufacturer's serial number of the device

(iii) device's geographic coordinates (latitude and longitude (NAD 83) accurate to +/- 50 m)

(iv) device's antenna height above ground level (meters)

(v) name of the individual or business that owns the device

(vi) name of a contact person responsible for the device's operation

(vii) address for the contact person

(viii) e-mail address for the contact person

(ix) phone number for the contact person.

* * * * *

(h) *TV bands database information.* The TV bands database shall contain the listed information for each of the following:

(1) Digital television stations, digital and analog Class A, low power, translator and booster stations, including stations in Canada and Mexico that are within the border coordination areas as specified in § 73.1650 of this chapter (a TV bands database is to include only TV station information from station license or license application records. In cases where a station has records for both a license application and a license, a TV bands database should include the information from the license application rather than the license. In cases where there are multiple license application records or license records for the same station, the database is to include the most recent records, and again with license applications taking precedence over licenses.):

(i) transmitter coordinates (latitude and longitude in NAD 83)

(ii) effective radiated power (ERP)

(iii) height above average terrain of the transmitting antenna (HAAT)

(iv) horizontal transmit antenna pattern (if the antenna is directional)

(v) amount of electrical and mechanical beam tilt (degrees depression below horizontal) and orientation of mechanical beam tilt (degrees azimuth clockwise from true north)

-
- (vi) channel number
 - (vii) station call sign

* * * * *

(6) MVPD receive sites. Registration for receive sites is limited to channels that are received over-the-air and are used as part of the MVPD service.

- (i) name and address of MVPD company
- (ii) location of the MVPD receive site (latitude and longitude in NAD 83, accurate to +/- 50 m)
- (iii) channel number of each television channel received, subject to the following condition: channels for which the MVPD receive site is located within the protected contour of that channel's transmitting station are not eligible for registration in the database
- (iv) call sign of each television channel received and eligible for registration
- (v) location (latitude and longitude) of the transmitter of each television channel received

(7) Television translator, low power TV and Class A TV station receive sites. Registration for television translator, low power TV and Class A receive sites is limited to channels that are received over-the-air and are used as part of the station's service.

- (i) call sign of the TV translator station
- (ii) location of the TV translator receive site (latitude and longitude in NAD 83, accurate to +/- 50 m)
- (iii) channel number of the re-transmitted television station, subject to the following condition: a channel for which the television translator receive site is located within the protected contour of that channel's transmitting station is not eligible for registration in the database
- (iv) call sign of the retransmitted television station
- (v) location (latitude and longitude) of the transmitter of the retransmitted television station

(8) Licensed low power auxiliary stations, including wireless microphones and wireless assist video devices. Use of licensed low power auxiliary stations at well defined times and locations may be registered in the database. Multiple registrations that specify more than one point in the facility may be entered for very large sites. Registrations will be valid for no more than one year, after which they may be renewed. Registrations must include the following information.

- (i) name of the individual or business responsible for the low power auxiliary device(s)
- (ii) an address for the contact person
- (iii) an email address for the contact person (optional)
- (iv) a phone number for the contact person
- (v) coordinates where the device(s) are used (latitude and longitude in NAD 83, accurate to +/- 50 m)
- (vi) channels used by the low power auxiliary devices operated at the site
- (vii) specific months, weeks, days of the week and times when the device(s) are used (on dates when microphones are not used the site will not be protected)
- (viii) the stations call sign.

(9) Unlicensed wireless microphones at venues of events and productions/shows that use large numbers of wireless microphones that cannot be accommodated in the two reserved channels and other channels that are not available for use by TVBDs at that location. Such sites of large events and productions/shows with significant wireless microphone use at well defined times and locations may be registered in the database. Entities responsible for eligible event venues registering their site with a TV bands data base are required to first make use of the two reserved channels and other channels that are not available for use by TVBDs at that location. As a benchmark, at least 6 – 8 wireless microphones should be operating in each channel used at such venues (both licensed and unlicensed wireless microphones used at the event may be counted to comply with this benchmark). Multiple registrations that specify more than one point in the facility may be entered for very large sites. Sites of eligible event venues using unlicensed wireless

microphones must be registered with the Commission at least 30 days in advance and the Commission will provide this information to the data base managers. Parties responsible for eligible event venues filing registration requests must certify that they are making use of all TV channels not available to TV bands devices and on which wireless microphones can practicably be used, including channels 7-51 (except channel 37). The Commission will make requests for registration of sites that use unlicensed wireless microphones public and will provide an opportunity for public comment or objections. Registrations will be valid for one year, after which they may be renewed. The Commission will take actions against parties that file inaccurate or incomplete information, such as denial of registration in the database, removal of information from the database pursuant to Section 15.713(i), or other sanctions as appropriate to ensure compliance with the rules. Registrations must include the following information.

- (i) name of the individual or business that owns the unlicensed wireless microphones
- (ii) an address for the contact person
- (iii) an email address for the contact person (optional)
- (iv) a phone number for the contact person
- (v) coordinates where the device(s) are used (latitude and longitude in NAD 83, accurate to +/- 50 m)
- (vi) channels used by the wireless microphones operated at the site and the number of wireless microphones used in each channel. As a benchmark, least 6 – 8 wireless microphones must be used in each channel. Registration requests that do not meet this criteria will not be registered in the TV bands data bases.
- (vii) specific months, weeks, days of the week and times when the device(s) are used (on dates when microphones are not used the site will not be protected)
- (viii) the name of the venue.

* * * * *

(j) *Security.* The TV bands database shall employ protocols and procedures to ensure that all communications and interactions between the TV bands database and TVBDs are accurate and secure and that unauthorized parties cannot access or alter the database or the list of available channels sent to a TVBD.

(i) Communications between TV bands devices and TV bands databases, and between different TV bands databases, shall be secure to prevent corruption or unauthorized interception of data. A TV bands database shall be protected from unauthorized data input or alteration of stored data.

(ii) A TV bands database shall verify that the FCC identification number supplied by a fixed or personal/portable TV bands device is for a certified device and may not provide service to an uncertified device.

(iii) A TV bands database must not provide lists of available channels to uncertified TV bands devices for purposes of operation (it is acceptable for a TV bands database to distribute lists of available channels by means other than contact with TVBDs to provide list of channels for operation). To implement this provision, a TV bands database administrator shall obtain a list of certified TVBDs from the FCC Equipment Authorization System.

10. Section 15.714 is amended by revising paragraph (a) to read as follows:

§ 15.714 TV bands database administration fees.

(a) A TV bands database administrator may charge a fee for provision of lists of available channels to fixed and personal/portable TVBDs and for registering fixed TVBDs.

* * * * *

11. Section 15.715 is amended by revising the introductory text, revising paragraphs (c), (d), (e) and (g) and by adding new paragraph (f) and re-designating the existing paragraphs (f) through and (k) as paragraphs (g) through (l) to read as follows:

§ 15.715 TV bands database administrator.

The Commission will designate one or more entities to administer the TV bands database(s). The Commission may, at its discretion, permit the functions of a TV bands database, such as a data repository, registration, and query services, to be divided among multiple entities; however, it will designate specific entities to be a database administrator responsible for coordination of the overall functioning of a database and providing services to TVBDs. Each database administrator designated by the Commission shall:

* * * * *

(c) Establish a process for registering fixed TVBDs and registering and including in the database facilities entitled to protection but not contained in a Commission database, including MVPD and TV translator receive sites.

(d) Establish a process for registering facilities where Part 74 low power auxiliary stations are used on a regular basis.

(e) Provide accurate lists of available channels to fixed and personal/portable TVBDs that submit to it the information required under §§ 15.713(e), (f), and (g) based on their geographic location and provide accurate lists of available channels to fixed and Mode II devices requesting lists of available channels for Mode I devices. Database administrators may allow prospective operators of TV bands devices to query the database and determine whether there are vacant channels at a particular location.

(f) Establish protocols and procedures to ensure that all communications and interactions between the TV bands database and TVBDs are accurate and secure and that unauthorized parties cannot access or alter the database or the list of available channels sent to a TVBD consistent with the provisions of Section 15.713(i).

(g) Make its services available to all unlicensed TV bands device users on a non-discriminatory basis.

(h) Provide service for a five-year term. This term can be renewed at the Commission's discretion.

(i) Respond in a timely manner to verify, correct and/or remove, as appropriate, data in the event that the Commission or a party brings claim of inaccuracies in the database to its attention. This requirement applies only to information that the Commission requires to be stored in the database.

(j) Transfer its database along with the IP addresses and URLs used to access the database and list of registered Fixed TVBDs, to another designated entity in the event it does not continue as the database administrator at the end of its term. It may charge a reasonable price for such conveyance.

(k) The database must have functionality such that upon request from the Commission it can indicate that no channels are available when queried by a specific TVBD or model of TVBDs.

(l) If more than one database is developed, the database administrators shall cooperate to develop a standardized process for providing on a daily basis or more often, as appropriate, the data collected for the facilities listed in § 15.713(b)(2) to all other TV bands databases to ensure consistency in the records of protected facilities.

12. Section 15.717 is amended by revising paragraphs (a) and (b) and adding a new paragraph (c) to read as follows:

§ 15.717 TVBDs that rely on spectrum sensing.

(a) *Applications for Certification.* Parties may submit applications for certification of TVBDs that rely solely on spectrum sensing to identify available channels. Devices authorized under this section must demonstrate with an extremely high degree of confidence that they will not cause harmful interference to incumbent radio services.

(1) In addition to the procedures in Subpart J of Part 2 of this chapter, applicants shall comply with the following.

(i) The application must include a full explanation of how the device will protect incumbent authorized services against interference.

(ii) Applicants must submit a pre-production device, identical to the device expected to be marketed.

(2) The Commission will follow the procedures below for processing applications pursuant to this section.

(i) Applications will be placed on Public Notice for a minimum of 30 days for comments and 15 days for reply comments. Applicants may request that portions of their application remain confidential in accordance with § 0.459 of this chapter. This Public Notice will include proposed test procedures and methodologies.

(ii) The Commission will conduct laboratory and field tests of the pre-production device. This testing will be conducted to evaluate proof of performance of the device, including characterization of its sensing capability and its interference potential. The testing will be open to the public.

(iii) Subsequent to the completion of testing, the Commission will issue by Public Notice, a test report including recommendations. The Public Notice will specify a minimum of 30 days for comments and, if any objections are received, an additional 15 days for reply comments.

(b) *Power limit for devices that rely on sensing.* The TVBD shall meet the requirements for personal/portable devices in this subpart except that it will be limited to a maximum EIRP of 50 mW per 6 megahertz of bandwidth on which the device operates and it does not have to comply with the requirements for geo-location and database access in § 15.711(b). Compliance with the detection threshold for spectrum sensing in § 15.717(c), although required, is not necessarily sufficient for demonstrating reliable interference avoidance. Once a device is certified, additional devices that are identical in electrical characteristics and antenna systems may be certified under the procedures of Part 2, Subpart J of this chapter.

(c) *Sensing requirements.*

(1) *Detection threshold.*

(i) The required detection thresholds are:

(A) ATSC digital TV signals: -114 dBm, averaged over a 6 MHz bandwidth;

(B) NTSC analog TV signals: -114 dBm, averaged over a 100 kHz bandwidth;

(C) Low power auxiliary, including wireless microphone, signals: -107 dBm, averaged over a 200 kHz bandwidth.

(ii) The detection thresholds are referenced to an omnidirectional receive antenna with a gain of 0 dBi. If a receive antenna with a minimum directional gain of less than 0 dBi is used, the detection threshold shall be reduced by the amount in dB that the minimum directional gain of the antenna is less than 0 dBi. Minimum directional gain shall be defined as the antenna gain in the direction and at the frequency that exhibits the least gain. Alternative approaches for the sensing antenna are permitted, *e.g.*, electronically rotatable antennas, provided the applicant for equipment authorization can demonstrate that its sensing antenna provides at least the same performance as an omnidirectional antenna with 0 dBi gain.

(2) *Channel availability check time.* A TVBD may start operating on a TV channel if no TV, wireless microphone or other low power auxiliary device signals above the detection threshold are detected within a minimum time interval of 30 seconds.

(3) *In-service monitoring.* A TVBD must perform in-service monitoring of an operating channel at least once every 60 seconds. There is no minimum channel availability check time for in-service monitoring.

(4) *Channel move time.* After a TV, wireless microphone or other low power auxiliary device signal is detected on a TVBD operating channel, all transmissions by the TVBD must cease within two seconds.